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EXAMINER	
WANG, JIN CHENG	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/715,428	Applicant(s) BENTZ, OLE	
	Examiner Jin-Cheng Wang	Art Unit 2672	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 July 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10,17-20 and 36-39* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10, 17-20, and 36-39* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's submission filed on 07/25/2005 has been entered. Claims 1-9, 11-16, 21-25, 27 have been canceled. Claims 10, 17-20, 26, 28-39 are pending in the application.

Response to Arguments

Applicant's arguments filed July 25, 2005 have been fully considered but are not found persuasive in view of the ground(s) of rejection set forth below.

In regard to the claims 10, 26, 36, 38 and similar claims, Grossman teaches a method of calculating a texture coordinate for a texture map having a size from an input texture coordinate value located in one of a plurality of predefined input ranges, comprising:

Concurrently calculating a plurality of singed texture coordinate values corresponding to the plurality of predefined input coordinate ranges and selecting an output texture coordinate from the plurality of concurrently calculated texture coordinate values and the input texture coordinate value.

With regards to the concurrently calculating a plurality of signed texture coordinate values, Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates **concurrently within** the Span Processor 120, i.e., *the border texture coordinates and the masked input texture coordinates are concurrently processed/calculated within one particular hardware unit.* Therefore, a plurality of texture coordinate values have been concurrently calculated. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust the size of the address space extending beyond the space of the

<u>stored texture map</u>; see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the outside mapping factor field. Moreover, the border texture coordinates are dependent upon **the ranges of the input texture map** (and the ranges of the input texture map may change) and should be determined for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and **the ranges of the input texture map**. **The ranges of the input texture map should not be restricted to the example illustration in the Grossman patent**. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined depending upon the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon **the size of the texture map**.

With regards to the selection of the output texture coordinate values from the calculated texture values under a variety of conditions depending on the sign of the calculated texture values and the sign of the input texture coordinate, Grossman teaches that, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and **the out-of-range input texture coordinates are suppressed or not being selected for the select mode**. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked input texture coordinates. **<u>In the clamping mode, the calculated border texture coordinates are selected</u>**

for out-of-range input texture coordinate and the masked input texture coordinates are selected for within-the-range input texture coordinates having the sign bits. The output coordinate coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and the border texture coordinates along with the sign bits. The masked input texture coordinates and the border texture coordinates are selected as output coordinates when the clamping mode is selected depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input texture coordinates and/or the input texture coordinates; column 10. Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based **on the texture mapping mode**, the signs of the masked texture coordinates and the sign of the input texture coordinate; column 9-10.

It would have been obvious to one of ordinary skill in the art to have used alternative way of calculating a plurality texture values, which are related to the input texture coordinate value and the texture map size because alternative values may be used as output texture coordinates when a different texture mapping mode is selected (Grossman column 10). Moreover, Grossman suggests that one of the alternative texture values may be also selected as the output texture coordinate with respect to the sign of the input texture coordinate and the sign of the calculated values because Grossman teaches selecting the calculated texture values as the output texture coordinate based on the texture mapping mode and the signs of the masked texture coordinates and the sign of the input texture coordinate (Grossman column 9-10).

Moreover, Grossman et al suggest the use of texture clamping (column 10, lines 4-16), the texture addressing circuit in figure 4, and the processing logic in figures 5a and 5b. With regards to the specific formula for calculating the texture coordinates, Grossman et al. further suggest linear interpolation of texture coordinates (column 9, lines 5-9) and the field definitions within an input texture map coordinate that supports clamping and a multi-pass technique for tiling large texture maps wherein an field is used to **expand** the address space of textures **beyond** the zero to one coordinate range stored in a hardware texture map (column 9, lines 10-41). With regards to the specific way of selecting texture coordinates, Grossman et al. further suggest in the processing logic that the compare value obtained from a compare register is tested against the masked value produced in processing block 503 and the result of this test determines whether or not an input coordinate is within a particular s,t coordinate range in which texturing is enabled (column 11, lines 1-28). Finally, it would have been obvious to one of ordinary skill in the arts to have incorporated the specific formula of calculating texture coordinates together with the specific way of selecting texture coordinates for texture remapping (or clamping) so that out-of-range texture coordinates can be re-mapped to the range of a texture map including the border of the range of the texture map. It is noted that the Grossman's reference deal with the same subject matter relating to texture addressing circuit in a graphics processing system. Moreover, the formula used in selecting the corresponding texture coordinates for a mapping mode are Routine Experimentation. See *In re Aller*, 105 USPQ 233, 235; 220 F2d 454 (CCPA 1955) (Note: the Examiner mistype the court case in earlier Office Action).

One of the ordinary skill in the art would have been motivated to modify the output texture coordinate value under a variety of conditions based on the texture mapping mode, the

signs of the calculated texture coordinates and the sign of the input texture coordinate, in particular the clamping mode is selected such that the selected output texture coordinate is clamped to an edge value along an edge of the texture map because Grossman teaches the clamping mode of the texture map or the output texture coordinate is selected in an alternative fashion by the select mode of the texture map (column 9-10).

One having the ordinary skill in the art would have been motivated to do this because it would have provided some formula for mapping the texture coordinates with the routine experimentation of the calculated values based on the input texture coordinates and thereby providing a means for controlling texture mapping of pixels outside the range of the texture map (column 10, lines 4-16) and realistic portrayal of the actual finished product in texture mapping (column 1, lines 31-63).

Applicant argues that the minimum fractional coordinate value for a texture map is zero, and the maximum fractional coordinate value for a texture map is all ones. However, **the zero border corresponds to the border texture coordinate having the coordinate fraction field setting to all zero and the positive border corresponds to the border texture coordinate having the coordinate fraction field setting to all ones**. The border texture coordinates are some specific examples of the texture coordinates in the format shown in Figure 3a, with each having the sign bits as well as the outside map factor field 307. Therefore, the border texture coordinates are signed values. The border coordinates still carry the sign bits in accordance to the Fig. 3a.

Applicant also argues that the border texture coordinates and the masked texture coordinates are not concurrently calculated. However, the texture coordinates are calculated

within one hardware unit either simultaneously or successively for each texture map and therefore these texture coordinates are concurrently calculated within a hardware unit of Grossman.

It is also noted that the texel is the same as the texture coordinate and the color value is just an example of the texel value or the texture coordinate value. Texel value is the value corresponding to a texture coordinate. Applicant's claim invention set forth some formula for mapping the texture coordinates. The different texture mapping coordinates selected for different mapping modes set forth in the claimed invention are resulted from Routine Experimentation since Grossman discloses mapping to the texture coordinates selected for different mapping modes. Applicant merely modifies the Grossman's mapping texture coordinates to come up with the claimed invention. See *In re Aller*, 105 USPQ 233, 235; 220 F2d 454 (CCPA 1955).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 10, 17-20, and 36-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grossman et al. U.S. Pat. No. 5,230,039 (hereinafter Grossman).

Claim 10:

(a) Grossman teaches a method of calculating a texture coordinate for a texture map having a size from an input texture coordinate value located in one of a plurality of predefined input ranges, comprising:

Concurrently calculating a plurality of signed texture coordinate values corresponding to the plurality of predefined input coordinate ranges (*Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates <u>concurrently</u> within the Span Processor 120. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust <u>the size of the address space extending beyond the space of the stored texture map</u>; see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the outside mapping factor field. Moreover, the border texture coordinates are dependent upon the ranges of the input texture map and should be determined for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined depending upon the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon the size of the texture map*);

Selecting an output texture coordinate from the plurality of concurrently calculated texture coordinate values and the input texture coordinate value (*Grossman teaches that, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the*

repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked input texture coordinates. ***The output texture coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and the border texture coordinates along with the sign bits****. Since the mapping ranges may change with respect to a texture map or since the input texture coordinates are signed, at least some of the output texture coordinates calculated for the clamping mode are thus signed. The masked input texture coordinates and the border texture coordinates are selected as output coordinates when the clamping mode is selected depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input texture coordinates and/or the input texture coordinates; column 10. Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based* ***on the texture mapping mode****, the signs of the masked texture coordinates and the sign of the input texture coordinate for the texture map ranges of a particular texture map; column 9-10*).

In other words, Grossman teaches a plurality of predefined input ranges such as the input ranges for the input regions shown in figure 6 and/or each of the respective input ranges for each of the texture coordinate axis. Grossman teaches calculated texture coordinate values in terms of the border values of the texture map and/or the masked input texture coordinates in accordance to **the ranges and sizes of the texture map**. The border texture **coordinates** have been

calculated with respect to each texture map. Grossman teaches selecting from the calculated texture coordinates (e.g., the border texture coordinates of the texture map and/or the masked input texture coordinates; these texture coordinates carry sign bits in addition to the outside mapping fields) and the input texture coordinates (e.g., the original or unmodified input coordinates) based on the texture mapping mode, the signs of the input texture coordinate (e.g., the sign bits of the input texture coordinates) and the signs of the calculated texture coordinates (e.g., the sign bits of the border coordinates as relating to each texture map and/or the masked input texture coordinates as relating to each selected texture mapping mode). **Grossman further teaches applying successive texture maps. In successive texture maps, the input texture coordinates are calculated for each of the plurality of texture mapping modes wherein the input texture coordinates for the next texture map are calculated as the output texture coordinates in the preceding texture map.**

(b) Grossman does not explicitly teach calculating a first value A and a second value B if the sign of the input texture coordinate is negative, and calculating a different first value A, a different second value B otherwise. Grossman does not explicitly teach selecting B when (A < 0) and the sign of the input texture coordinate is negative and selecting A as the output texture coordinate otherwise; where the input texture coordinate value is equal to zero or the sign of the input texture coordinate is positive, selecting the input texture coordinate when (A <0), selecting A when (B < 0), and selecting B otherwise.

(c) With regards to the concurrently calculating a plurality of signed texture coordinate values using the two sets of the A and B values, Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates <u>concurrently</u> within the Span Processor

120 and therefore a plurality of texture coordinate values have been calculated. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust the size of the address space extending beyond the space of the stored texture map; see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the outside mapping factor field. Moreover, the border texture coordinates are dependent upon the ranges of the input texture map and should be determined for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined depending upon **the input ranges of the texture map**. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon the size of the texture map.

With regards to the selection of the output texture coordinate values from the calculated texture values, A, B depending on a variety of conditions depending on the sign of the calculated texture values and the sign of the input texture coordinate, Grossman teaches that, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked input texture

coordinates. The output coordinate coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and the border texture coordinates along with the sign bits. The masked input texture coordinates and the border texture coordinates are selected as output coordinates when the clamping mode is selected depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input texture coordinates and/or the input texture coordinates; column 10. Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based **on the texture mapping mode**, the signs of the masked texture coordinates and the sign of the input texture coordinate; column 9-10.

(d) It would have been obvious to one of ordinary skill in the art to have used alternative way of calculating a plurality texture values, A, B, which are related to the input texture coordinate value and the texture map size because alternative values may be used as output texture coordinates when a different texture mapping mode is selected (Grossman column 10). Moreover, Grossman suggests that one of the alternative texture values may be also selected as the output texture coordinate with respect to the sign of the input texture coordinate and the sign of the calculated values because Grossman teaches selecting the calculated texture values as the output texture coordinate based on the texture mapping mode and the signs of the masked texture coordinates and the sign of the input texture coordinate (Grossman column 9-10).

Moreover, Grossman et al suggest the use of texture clamping (column 10, lines 4-16), the texture addressing circuit in figure 4, and the processing logic in figures 5a and 5b. With regards to the specific formula for calculating the texture coordinates, Grossman et al. further

suggest linear interpolation of texture coordinates (column 9, lines 5-9) and the field definitions within an input texture map coordinate that supports clamping and a multi-pass technique for tiling large texture maps wherein an field is used to expand the address space of textures beyond the zero to one coordinate range stored in a hardware texture map (column 9, lines 10-41). With regards to the specific way of selecting texture coordinates, Grossman et al. further suggest in the processing logic that the compare value obtained from a compare register is tested against the masked value produced in processing block 503 and the result of this test determines whether or not an input coordinate is within a particular s,t coordinate range in which texturing is enabled (column 11, lines 1-28). Finally, it would have been obvious to one of ordinary skill in the arts to have incorporated the specific formula of calculating texture coordinates together with the specific way of selecting texture coordinates for texture remapping (or clamping) so that out-of-range texture coordinates can be re-mapped to the range of a texture map including the border of the range of the texture map. It is noted that the Grossman's reference deal with the same subject matter relating to texture addressing circuit in a graphics processing system. Moreover, the formula used in selecting the corresponding texture coordinates for a mapping mode are Routine Experimentation. The different texture mapping coordinates selected for different mapping modes set forth in the claimed invention are resulted from Routine Experimentation since Grossman discloses mapping to the texture coordinates selected for different mapping modes. Applicant merely modifies the Grossman's mapping texture coordinates to come up with the claimed invention. See *In re Aller*, 105 USPQ 233, 235; 220 F2d 454 (CCPA 1955).

(e) One of the ordinary skill in the art would have been motivated to modify the output texture coordinate value under a variety of conditions based on the texture mapping mode, the

signs of the calculated texture coordinates and the sign of the input texture coordinate, in particular the clamping mode is selected such that the selected output texture coordinate is clamped to an edge value along an edge of the texture map because Grossman teaches the clamping mode of the texture map or the output texture coordinate is selected in an alternative fashion by the select mode of the texture map (column 9-10).

One having the ordinary skill in the art would have been motivated to do this because it would have provided some formula for mapping the texture coordinates with the routine experimentation of the calculated values based on the input texture coordinates and thereby providing a means for controlling texture mapping of pixels outside the range of the texture map (column 10, lines 4-16) and realistic portrayal of the actual finished product in texture mapping (column 1, lines 31-63).

Claim 20:

The claim 20 encompasses the same scope of invention as that of claim 10 except additional claimed limitation of determining, calculating, and selecting being repeated for each axis of the texture map. However, Grossman further discloses the claimed limitation of determining, calculating, and selecting being repeated for each axis of the texture map (*column 11, lines 1-28*).

Claim 36:

(a) Grossman teaches a method of calculating a texture coordinate for a texture map having a size from an input texture coordinate value located in one of a plurality of predefined input ranges, comprising:

Concurrently calculating a plurality of singed texture coordinate values corresponding to the plurality of predefined input coordinate ranges (*Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates* <u>*concurrently*</u> *within the Span Processor 120. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust* <u>*the size of the address space extending beyond the space of the stored texture map*</u>*; see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the outside mapping factor field. Moreover, the border texture coordinates are dependent upon the ranges of the input texture map and should be determined for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined depending upon the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon the size of the texture map*);

Selecting an output texture coordinate from the plurality of concurrently calculated texture coordinate values and the input texture coordinate value (*Grossman teaches that, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the*

repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked input texture coordinates. The output coordinate coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and the border texture coordinates along with the sign bits. The masked input texture coordinates and the border texture coordinates are selected as output coordinates when the clamping mode is selected depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input texture coordinates and/or the input texture coordiantes; column 10. Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based ***on the texture mapping mode****, the signs of the masked texture coordinates and the sign of the input texture coordinate; column 9-10*).

In other words, Grossman teaches a plurality of predefined input ranges such as the input ranges for the input regions shown in figure 6 and/or each of the respective input ranges for each of the texture coordinate axis. Grossman teaches calculated texture coordinate values in terms of the border values of the texture map and/or the masked input texture coordinates in accordance to the ranges and sizes of the texture map. The border texture **coordinates** have been calculated with respect to each texture map. Grossman teaches selecting from the calculated texture coordinates (e.g., the border texture coordinates of the texture map and/or the masked input texture coordinates; **these texture coordinates carry sign bits in addition to the outside**

mapping fields) and the input texture coordinates (e.g., the original or unmodified input coordinates) based on the texture mapping mode, the signs of the input texture coordinate (e.g., the sign bits of the input texture coordinates) and the signs of the calculated texture coordinates (e.g., the sign bits of the border coordinates as relating to each texture map and/or the masked input texture coordinates as relating to each selected texture mapping mode). Grossman further teaches applying successive texture maps. In successive texture maps, the input texture coordinates are calculated for each of the plurality of texture mapping modes wherein the input texture coordinates for the next texture map are calculated as the output texture coordinates in the preceding texture map.

(b) Grossman does not explicitly teach calculating a first value A and a second value B if the sign of the input texture coordinate is negative, and calculating a first value A, a second value B and a third value C otherwise. Grossman does not explicitly teach selecting B when ($A < 0$) and the sign of the input texture coordinate is negative and selecting C as the output texture coordinate otherwise and selecting the input texture coordinate when ($A <0$), selecting C when ($B < 0$), and selecting B otherwise.

(c) With regards to the concurrently calculating a plurality of signed texture coordinate values using A, B and C values, Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates <u>concurrently</u> within the Span Processor 120 and therefore a plurality of texture coordinate values have been calculated. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust <u>the size of the address space extending beyond the space of the stored texture map</u>; see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the

outside mapping factor field. Moreover, the border texture coordinates are dependent upon the ranges of the input texture map and should be determined for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined depending upon the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon the size of the texture map);

With regards to the selection of the output texture coordinate values from the calculated texture values, A, B, C depending on a variety of conditions depending on the sign of the calculated texture values and the sign of the input texture coordinate, Grossman teaches that, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked input texture coordinates. The output coordinate coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and the border texture coordinates along with the sign bits. The masked input texture coordinates and the border texture coordinates are selected as output coordinates when the clamping mode is selected depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input

texture coordinates and/or the input texture coordinates; column 10. Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based **on the texture mapping mode**, the signs of the masked texture coordinates and the sign of the input texture coordinate; column 9-10.

(d) It would have been obvious to one of ordinary skill in the art to have used alternative way of calculating a plurality texture values, A, B, and C, which are related to the input texture coordinate value and the texture map size because alternative values may be used as output texture coordinates when a different texture mapping mode is selected (Grossman column 10). Moreover, Grossman suggests that one of the alternative texture values may be also selected as the output texture coordinate with respect to the sign of the input texture coordinate and the sign of the calculated values because Grossman teaches selecting the calculated texture values as the output texture coordinate based on the texture mapping mode and the signs of the masked texture coordinates and the sign of the input texture coordinate (Grossman column 9-10).

Moreover, Grossman et al suggest the use of texture clamping (column 10, lines 4-16), the texture addressing circuit in figure 4, and the processing logic in figures 5a and 5b. With regards to the specific formula for calculating the texture coordinates, Grossman et al. further suggest linear interpolation of texture coordinates (column 9, lines 5-9) and the field definitions within an input texture map coordinate that supports clamping and a multi-pass technique for tiling large texture maps wherein an field is used to expand the address space of textures beyond the zero to one coordinate range stored in a hardware texture map (column 9, lines 10-41). With regards to the specific way of selecting texture coordinates, Grossman et al. further suggest in the

processing logic that the compare value obtained from a compare register is tested against the masked value produced in processing block 503 and the result of this test determines whether or not an input coordinate is within a particular s,t coordinate range in which texturing is enabled (column 11, lines 1-28). Finally, it would have been obvious to one of ordinary skill in the arts to have incorporated the specific formula of calculating texture coordinates together with the specific way of selecting texture coordinates for texture remapping (or clamping) so that out-of-range texture coordinates can be re-mapped to the range of a texture map including the border of the range of the texture map. It is noted that the Grossman's reference deal with the same subject matter relating to texture addressing circuit in a graphics processing system. Moreover, the formula used in selecting the corresponding texture coordinates for a mapping mode are Routine Experimentation. The different texture mapping coordinates selected for different mapping modes set forth in the claimed invention are resulted from Routine Experimentation since Grossman discloses mapping to the texture coordinates selected for different mapping modes. Applicant merely modifies the Grossman's mapping texture coordinates to come up with the claimed invention. See *In re Aller*, 105 USPQ 233, 235; 220 F2d 454 (CCPA 1955) (Note: the Examiner mistype the court case in earlier Office Action).

(e) One of the ordinary skill in the art would have been motivated to modify the output texture coordinate value under a variety of conditions based on the texture mapping mode, the signs of the calculated texture coordinates and the sign of the input texture coordinate, in particular the clamping mode is selected such that the selected output texture coordinate is clamped to an edge value along an edge of the texture map because Grossman teaches the clamping mode of the texture map (column 9-10).

One having the ordinary skill in the art would have been motivated to do this because it would have provided some formula for mapping the texture coordinates with the routine experimentation of the calculated values based on the input texture coordinates and thereby providing a means for controlling texture mapping of pixels outside the range of the texture map (column 10, lines 4-16) and realistic portrayal of the actual finished product in texture mapping (column 1, lines 31-63).

Claim 37:

The claim 37 encompasses the same scope of invention as that of claim 36 except additional claimed limitation of determining, calculating, and selecting being repeated for each axis of the texture map. However, Grossman further discloses the claimed limitation of determining, calculating, and selecting being repeated for each axis of the texture map (*column 11, lines 1-28*).

Claim 38:

(a) Grossman teaches a method of calculating a texture coordinate for a texture map having a size from an input texture coordinate value located in one of a plurality of predefined input ranges, comprising:

Concurrently calculating a plurality of singed texture coordinate values corresponding to the plurality of predefined input coordinate ranges (*Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates <u>concurrently</u> within the Span Processor 120. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust <u>the size of the address space extending beyond the space of the stored texture</u>*

map; *see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the outside mapping factor field. Moreover, the border texture coordinates are dependent upon the ranges of the input texture map and should be determined for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined depending upon the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon the size of the texture map*);

Selecting an output texture coordinate from the plurality of concurrently calculated texture coordinate values and the input texture coordinate value (*Grossman teaches that, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked input texture coordinates. The output coordinate coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and the border texture coordinates along with the sign bits. The masked input texture coordinates and the border texture coordinates are selected as output coordinates when the clamping mode is*

selected depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input texture coordinates and/or the input texture coordiantes; column 10. Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based ***on the texture mapping mode****, the signs of the masked texture coordinates and the sign of the input texture coordinate; column 9-10*); and

Clamping the selected output texture coordinate to a clamped value (column 10, lines 4-16).

In other words, Grossman teaches a plurality of predefined input ranges such as the input ranges for the input regions shown in figure 6 and/or each of the respective input ranges for each of the texture coordinate axis. Grossman teaches calculated texture coordinate values in terms of the border values of the texture map and/or the masked input texture coordinates in accordance to the ranges and sizes of the texture map. The border texture **coordinates** have been calculated with respect to each texture map. Grossman teaches selecting from the calculated texture coordinates (e.g., the border texture coordinates of the texture map and/or the masked input texture coordinates; these texture coordinates carry sign bits in addition to the outside mapping fields) and the input texture coordinates (e.g., the original or unmodified input coordinates) based on the texture mapping mode, the signs of the input texture coordinate (e.g., the sign bits of the input texture coordinates) and the signs of the calculated texture coordinates (e.g., the sign bits of the border coordinates as relating to each texture map and/or the masked input texture coordinates as relating to each selected texture mapping mode). Grossman further teaches applying successive texture maps. In successive texture maps, the input texture coordinates are

calculated for each of the plurality of texture mapping modes wherein the input texture coordinates for the next texture map are calculated as the output texture coordinates in the preceding texture map.

(b) Grossman does not explicitly teach calculating a first value A and a second value B if the sign of the input texture coordinate is negative, and calculating a first value A, a second value B and a third value C otherwise. Grossman does not explicitly teach selecting B when (A < 0) and the sign of the input texture coordinate is negative and selecting C as the output texture coordinate otherwise and selecting the input texture coordinate when (A <0), selecting C when (B < 0), and selecting B otherwise.

(c) With regards to the concurrently calculating a plurality of signed texture coordinate values using A, B and C values, Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates <u>concurrently</u> within the Span Processor 120 and therefore a plurality of texture coordinate values have been calculated. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust <u>the size of the address space extending beyond the space of the stored texture map</u>; see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the outside mapping factor field. Moreover, the border texture coordinates are dependent upon the ranges of the input texture map and should be determined for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined

depending upon the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon the size of the texture map);

With regards to the selection of the output texture coordinate values from the calculated texture values, A, B, C depending on a variety of conditions depending on the sign of the calculated texture values and the sign of the input texture coordinate, Grossman teaches that, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked input texture coordinates. The output coordinate coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and the border texture coordinates along with the sign bits. The masked input texture coordinates and the border texture coordinates are selected as output coordinates when the clamping mode is selected depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input texture coordinates and/or the input texture coordinates; column 10. Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based **on the texture mapping mode**, the signs of the masked texture coordinates and the sign of the input texture coordinate; column 9-10.

(d) It would have been obvious to one of ordinary skill in the art to have used alternative way of calculating a plurality texture values, A, B, and C, which are related to the input texture coordinate value and the texture map size because alternative values may be used as output texture coordinates when a different texture mapping mode is selected (Grossman column 10). Moreover, Grossman suggests that one of the alternative texture values may be also selected as the output texture coordinate with respect to the sign of the input texture coordinate and the sign of the calculated values because Grossman teaches selecting the calculated texture values as the output texture coordinate based on the texture mapping mode and the signs of the masked texture coordinates and the sign of the input texture coordinate (Grossman column 9-10).

Moreover, Grossman et al suggest the use of texture clamping (column 10, lines 4-16), the texture addressing circuit in figure 4, and the processing logic in figures 5a and 5b. With regards to the specific formula for calculating the texture coordinates, Grossman et al. further suggest linear interpolation of texture coordinates (column 9, lines 5-9) and the field definitions within an input texture map coordinate that supports clamping and a multi-pass technique for tiling large texture maps wherein an field is used to expand the address space of textures beyond the zero to one coordinate range stored in a hardware texture map (column 9, lines 10-41). With regards to the specific way of selecting texture coordinates, Grossman et al. further suggest in the processing logic that the compare value obtained from a compare register is tested against the masked value produced in processing block 503 and the result of this test determines whether or not an input coordinate is within a particular s,t coordinate range in which texturing is enabled (column 11, lines 1-28). Finally, it would have been obvious to one of ordinary skill in the arts to have incorporated the specific formula of calculating texture coordinates together with the

specific way of selecting texture coordinates for texture remapping (or clamping) so that out-of-range texture coordinates can be re-mapped to the range of a texture map including the border of the range of the texture map. It is noted that the Grossman's reference deal with the same subject matter relating to texture addressing circuit in a graphics processing system. Moreover, the formula used in selecting the corresponding texture coordinates for a mapping mode are Routine Experimentation. See *In re Karlson*, 136 USPQ 184, 186; 311 F2d 581 (CCPA 1963).

(e) One of the ordinary skill in the art would have been motivated to modify the output texture coordinate value under a variety of conditions based on the texture mapping mode, the signs of the calculated texture coordinates and the sign of the input texture coordinate, in particular the clamping mode is selected such that the selected output texture coordinate is clamped to an edge value along an edge of the texture map because Grossman teaches the clamping mode of the texture map (column 9-10).

One having the ordinary skill in the art would have been motivated to do this because it would have provided some formula for mapping the texture coordinates with the routine experimentation of the calculated values based on the input texture coordinates and thereby providing a means for controlling texture mapping of pixels outside the range of the texture map (column 10, lines 4-16) and realistic portrayal of the actual finished product in texture mapping (column 1, lines 31-63).

Claim 39:

The claim 39 encompasses the same scope of invention as that of claim 38 except additional claimed limitation of determining, calculating, and selecting being repeated for each

axis of the texture map. However, Grossman further discloses the claimed limitation of determining, calculating, and selecting being repeated for each axis of the texture map (*column 11, lines 1-28*).

Claim 17:

The claim 17 encompasses the same scope of invention as that of the claim 38 except additional claim limitation that clamping the selected output texture coordinate comprises clamping the output texture coordinate to an edge value along an edge of the texture map. However, Grossman further discloses clamping the selected output texture coordinate to the border of the texture map (column 10, lines 4-16).

Claims 18-19:

The claim 18 encompasses the same scope of invention as that of the claim 38 except additional claim limitation of clamping the selected output texture coordinate comprising clamping the output texture coordinate to a border value one texel beyond the texture map or half of a texel beyond an edge of the texture map.

Grossman is silent to the claim limitation of "clamping the output texture coordinate to a border value one texel beyond the texture map" or the claim limitation of "clamping the output texture coordinate to a border value half of a texel beyond an edge of the texture map."

Grossman, however, discloses clamping the selected output texture coordinate to the border of the texture map (column 10, lines 4-16).

It would have been obvious to one of ordinary skill in the art to have used alternative output texture coordinate values by clamping the texture coordinate to a border value half of a texel beyond an edge of the texture map or a border value a texel beyond an edge of the texture

map because alternative texture values may be used as output texture coordinates when a different texture mapping mode is selected (Grossman column 10). Moreover, Grossman suggests that one of the alternative texture values may be also selected as the output texture coordinate with respect to the sign of the input texture coordinate and the sign of the calculated values because Grossman teaches selecting the calculated texture values as the output texture coordinate based on the texture mapping mode and the signs of the masked texture coordinates and the sign of the input texture coordinate wherein the texture coordinate values are differently selected (Grossman column 9-10).

One of the ordinary skill in the art would have been motivated to modify the output texture coordinate value under a variety of conditions depending on the different texture mapping mode, the signs of the calculated texture coordinates and the sign of the input texture coordinate, in particular the clamping mode is selected such that the selected output texture coordinate is clamped to an edge value versus an alternative value along the edge of the texture map because Grossman teaches the clamping mode of the texture map (column 10, lines 4-16).

One having the ordinary skill in the art would have been motivated to do this because it would have provided some formula for mapping the texture coordinates with the routine experimentation of the calculated values based on the input texture coordinates and thereby providing a means for controlling texture mapping of pixels outside the range of the texture map (column 10, lines 4-16) and realistic portrayal of the actual finished product in texture mapping (column 1, lines 31-63).

3. Claims 26, and 28-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grossman et al. U.S. Pat. No. 5,230,039 (hereinafter Grossman) in view of Dignam U.S. Patent No. 6,452,603 (hereinafter Dignam).

4. Claim 26:

Grossman has taught a texture address circuit (figures 4-5) for calculating texture coordinates for a texture map having a size and an acceptable range of input coordinate values (column 10, lines 28-49), the circuit comprising:

A plurality of coordinate calculation circuits (figure 4) corresponding to a plurality of input coordinate ranges defined outside of the acceptable range for both negative and positive input coordinate values (column 10, lines 28-49), each coordinate calculation circuit (Mask register 430 and compare register 432) coupled to receive a signal corresponding to the sign of the input coordinate value and a respective texture size value corresponding to a multiple of the size of the texture map (column 10, lines 28-49), each coordinate calculation circuit providing a respective signed coordinate output value (column 10, lines 28-49) calculated from the input texture coordinate value and the size of the texture map (*Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates <u>concurrently</u> within the Span Processor 120. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust <u>the size of the address space extending beyond the space of the stored texture map</u>; see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the outside mapping factor field. Moreover, the border texture coordinates are dependent upon the ranges of the input texture map and should be determined*

for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined depending upon the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon the size of the texture map);

A selection circuit (e.g., compare registers 432 and 433) coupled to concurrently receive as input values the input coordinate (column 10, lines 52-67) and the coordinate output values of the plurality of coordinate calculation circuits (column 11, lines 1-28), the selection circuit selecting one of the input values as an output texture coordinate value (*e.g., the compare value obtained from a compare register is tested against the masked value produced in processing block 503 and the result of this test determines whether or not an input coordinate is within a particular s, t coordinate range in which texturing is enabled. See column 11, lines 1-28*); and

Select logic (*figures 5a and 5b*) coupled to the selection circuit and further coupled to receive input signals corresponding the sign of the input coordinate value (e.g., the outside map factor field and the sign bit of the input coordinate is obtained at processing block 502) and the signs of the coordinate output values (*A mask value is obtained from mask register A or mask register B, see column 11, lines 1-7*), the select logic providing a selection signal commanding the selection circuit to select one of the input values as the output texture coordinate in accordance with the received input signals (*column 10, lines 52-67, and column 11, lines 1-28*).

(b) Although Grossman does not explicitly disclose the claim limitation of a first and a second coordinate calculation circuits of the plurality including a negating circuit configured to generate an output value corresponding to a positive or negative respective texture size value in accordance with the sign of the input coordinate value; and further including a summing circuit having a first input coupled to negating circuit and a second input at which a second input value is provided, the summing circuit configured to generate an output corresponding to the sum of the output value of the negating circuit and a value received by at the second input. However, Grossman implicitly discloses or suggests the claim limitation of a first and a second coordinate calculation circuits of the plurality (*column 10, lines 52-67, and column 11, lines 1-28*) including a negating circuit configured to generate an output value corresponding to a positive or negative respective texture size value in accordance with the sign of the input coordinate value (*column 10, lines 4-49*); and further including a summing circuit having a first input coupled to negating circuit and a second input at which a second input value is provided, the summing circuit configured to generate an output corresponding to the sum of the output value of the negating circuit and a value received by at the second input (column 10, lines 52-67, and column 11, lines 1-28).

(c) Dignam discloses a graphics processor for calculating texels including a texture address generator as well as a first and a second coordinate calculation circuits of the plurality including a negating circuit configured to generate an output value corresponding to a positive or negative respective texture size value in accordance with the sign of the input coordinate value (*Figs. 3D-6C and the corresponding descriptions*); and further including a summing circuit

having a first input coupled to negating circuit and a second input at which a second input value is provided, the summing circuit configured to generate an output corresponding to the sum of the output value of the negating circuit and a value received by at the second input (*Figs. 3D-6C and the corresponding descriptions*).

With regards to the claim limitation cited in above, Grossman implicitly teaches the claim limitation because circuits need to be constructed for the implementation of concurrently calculating a plurality of signed texture coordinate values in which Grossman discloses a number of hardware for such implementation including the Span Processor 120. For example, Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates <u>concurrently</u> within the Span Processor 120 and therefore a plurality of texture coordinate values have been calculated. Grossman teaches calculating the texture coordinate values based on the mask registers to adjust <u>the size of the address space extending beyond the space of the stored texture map</u>; see column 10, wherein the calculated input texture coordinate is the masked texture coordinate with masked off bits in the outside mapping factor field. Moreover, the border texture coordinates are dependent upon the ranges of the input texture map and should be determined for each texture map. Therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map. The masked texture coordinates are determined for each selected texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode. The masked input texture coordinates are determined depending upon the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the

address space extending beyond the space of the stored texture map, the masked texture coordinates depend upon the size of the texture map);

Grossman teaches that, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked input texture coordinates. The output coordinate coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and the border texture coordinates along with the sign bits. The masked input texture coordinates and the border texture coordinates are selected as output coordinates when the clamping mode is selected depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input texture coordinates and/or the input texture coordinates; column 10. Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based **<u>on the texture mapping mode</u>**, the signs of the masked texture coordinates and the sign of the input texture coordinate; column 9-10.

(d) It would have been obvious to one of ordinary skill in the art to have implemented the texture coordinate calculation of Grossman in a negating circuit and summing circuit as the series of circuits have been taught by Dignam in a detailed implementation because such circuits are normally constructed in a graphics processing hardware for calculating a plurality texture

values, which are related to the input texture coordinate value and the texture map size when a different texture mapping mode is selected (Grossman column 10).

Moreover, Grossman et al suggest the use of texture clamping (column 10, lines 4-16), the texture addressing circuit in figure 4, and the processing logic in figures 5a and 5b. With regards to the specific formula for calculating the texture coordinates, Grossman et al. further suggest linear interpolation of texture coordinates (column 9, lines 5-9) and the field definitions within an input texture map coordinate that supports clamping and a multi-pass technique for tiling large texture maps wherein an field is used to expand the address space of textures beyond the zero to one coordinate range stored in a hardware texture map (column 9, lines 10-41). Grossman et al. further suggest in the processing logic that the compare value obtained from a compare register is tested against the masked value produced in processing block 503 and the result of this test determines whether or not an input coordinate is within a particular s,t coordinate range in which texturing is enabled (column 11, lines 1-28). Finally, it would have been obvious to one of ordinary skill in the arts to have incorporated the recited circuits of calculating texture coordinates and selecting texture coordinates for texture remapping (or clamping) so that out-of-range texture coordinates can be re-mapped to the range of a texture map including the border of the range of the texture map. It is noted that the Grossman's reference deal with the same subject matter relating to texture addressing circuit in a graphics processing system.

(e) One having the ordinary skill in the art would have been motivated to do this because it would have provided some circuits for the implementation of the method of Grossman for mapping the texture coordinates based on the input texture coordinates and thereby providing a

means for controlling texture mapping of pixels outside the range of the texture map (column 10, lines 4-16) and realistic portrayal of the actual finished product in texture mapping (column 1, lines 31-63).

Claim 28:

Grossman teaches the negate circuit comprising an inverter and an exclusive OR gate (column 10, lines 52-67, and column 11, lines 1-28).

Claim 33:

Grossman teaches the select logic generates a selection signal to select the output texture coordinate (column 10, lines 52-67, and column 11, lines 1-28).

5. Claims 29-32 and 34-35:

(a) The claims 29-32 and 34 encompasses the same scope of invention as that of claim 27 except additional claimed limitation of the specific formula for calculating the texture coordinates and the specific way of selecting the corresponding texture coordinates.

(b) However, Grossman is silent on the specific formula for calculating the texture coordinates and the specific way of selecting the corresponding texture coordinates.

(c) It would have been obvious to one of ordinary skill in the art to have incorporated the specific formula for calculating the texture coordinates and specific way of selecting the corresponding texture coordinates into Grossman et al.'s texture addressing circuit because Grossman et al suggest the use of texture clamping (column 10, lines 4-16), the texture addressing circuit in figure 4, and the processing logic in figures 5a and 5b. With regards to the

specific formula for calculating the texture coordinates, Grossman et al. further suggest linear interpolation of texture coordinates (column 9, lines 5-9) and the field definitions within an input texture map coordinate that supports clamping and a multi-pass technique for tiling large texture maps wherein an field is used to expand the address space of textures beyond the zero to one coordinate range stored in a hardware texture map (column 9, lines 10-41). With regards to the specific way of selecting texture coordinates, Grossman et al. further suggest in the processing logic that the compare value obtained from a compare register is tested against the masked value produced in processing block 503 and the result of this test determines whether or not an input coordinate is within a particular s,t coordinate range in which texturing is enabled (column 11, lines 1-28). Finally, it would have been obvious to one of ordinary skill in the arts to have incorporated the specific formula of calculating texture coordinates together with the specific way of selecting texture coordinates for texture remapping (or clamping) so that out-of-range texture coordinates can be re-mapped to the range of a texture map including the border of the range of the texture map. It is noted that the Grossman's reference deal with the same subject matter relating to texture addressing circuit in a graphics processing system. Moreover, the formula used in selecting the corresponding texture coordinates for a mapping mode are Routine Experimentation. See *In re Aller*, 105 USPQ 233, 235; 220 F2d 454 (CCPA 1955) (Note: the Examiner mistype the court case in earlier Office Action).

(d) One having the ordinary skill in the art would have been motivated to do this because it would have provided some formula for mapping the texture coordinates with the routine experimentation of the calculated values based on the input texture coordinates and thereby providing a means for controlling texture mapping of pixels outside the range of the texture map

(column 10, lines 4-16) and realistic portrayal of the actual finished product in texture mapping (column 1, lines 31-63).

Claim 35:

The claim 35 encompasses the same scope of invention as that of claim 34 except additional claimed limitation of a clamping circuit coupled to receive the output texture coordinate of the selection circuit when in the clamping mode and provide a clamped output texture coordinate. However, Grossman further discloses the claimed limitation of a clamping circuit coupled to receive the output texture coordinate of the selection circuit when in the clamping mode and provide a clamped output texture coordinate (column 10, lines 4-16).

Remarks

The border texture coordinates are calculated because the border texture coordinates are highly dependent on the ranges of the input texture map for each texture map. The border texture coordinates are determined from the ranges of the input texture map *for each texture map* and therefore, the border texture coordinates are calculated based on the input texture coordinates and the ranges of the input texture map *for each texture map*. The cited portion of Grossman discloses a portion of the texture coordinates such as the coordinate fraction field of the input coordinate is set to a value corresponding to the most positive address value of the texture map and setting the coordinate field to all ones operates to clamp the texture value of the out of range pixel to the value stored at the most positive border of the texture map. Grossman also discloses that the coordinate fraction field of the input coordinate is therefore set of all zeros and the

negative input coordinate is thereby clamped to the least positive border or the zero border of the texture map. In view of Grossman's teaching, the most positive border or the least positive border of the texture map in Grossman refers to the texture coordinate in the format of Fig. 3a, rather than an outside map factor field or the value relating to the outside map factor field in the portion of a texture coordinate. Moreover, the most positive border of the texture map and the least positive border of the texture are still calculated for the different ranges of the texture map for each texture map. The fraction field of the input coordinates are set to the corresponding fraction field of the calculated border texture coordinates in according to the selected clamping mode.

Finally, it clear, from Grossman's teaching, that the border texture coordinates change with respect to the size of the texture map. In contrary to Applicant's argument that the texture values of zero and the maximum binary value for the borders of texture regions do not change with respect to the texture size, the border texture coordinates change with respect to the size of the texture map.

Grossman teaches calculating one of the border texture coordinates and the masked texture coordinates concurrently within the Span Processor 120. Grossman teaches calculating the texture coordinates based on the mask registers to adjust <u>the size of the address space extending beyond the space of the stored texture map</u>; column 10, wherein the calculated input texture coordinates are in the form of the masked texture coordinates. Note that the masked texture coordinates refer to the input texture coordinates with masked off bits in the outside map factor field 307.

Because the masked texture coordinates are highly dependent upon the texture mapping mode selected from a plurality of texture mapping modes such as the repeat mode, the clamping mode, and the select mode, the masked input texture coordinates are determined from the input ranges of the texture map. Also because the masked texture coordinates are determined based on the size of the address space extending beyond the space of the stored texture map, the masked texture coordinates are dependent upon the size of the texture map. Moreover, in the selection of a texture mapping mode from a plurality of texture mapping modes such as the repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates depends on the calculated border texture coordinates and the masked texture coordinates. The output coordinates are calculated for the clamping mode **based on the sign bits of the input texture coordinates** and/or masked input texture coordinates and/or the border texture coordinates. The masked input texture coordinates and the border texture coordinates are selected as output coordinate coordinates for the clamping mode depending upon the ranges of the masked input texture coordinates and/or the sign bits of the masked input texture coordinates; see column 10.

Clearly, Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinates and the input texture coordinates which one to be provided as an output texture coordinate based on the texture mapping mode, the signs of the masked texture coordinates and the sign of the input texture coordinate; column 9-10.

The border texture coordinates are some specific examples of the texture coordinates in the format shown in Figure 3a, with each having the sign bits as well as the outside map factor field 307. Therefore, the border texture coordinates are signed values. **The zero border corresponds to the border texture coordinate having the coordinate fraction field setting to all zero and the positive border corresponds to the border texture coordinate having the coordinate fraction field setting to all ones**. The border coordinates still carry the sign bits in accordance to the Fig. 3a.

In the selection of a texture mapping mode from a plurality of texture mapping modes such as the repeat mode, the clamping mode and the select mode, the out-of-range input texture coordinates are selected for the repeat mode and the out-of-range input texture coordinates are suppressed or not being selected for the select mode. In the clamping mode, the selection of the output texture coordinates is highly dependent on the calculated border texture coordinates and the masked texture coordinates. The output texture coordinates are calculated for the clamping mode based on the input texture coordinates and/or masked input texture coordinates and/or the border texture values along with sign bits. The masked input texture coordinates and the border texture coordinates are selected as output coordinate for the clamping mode depending upon the ranges of and/or the sign bits of the masked input texture coordinates; see column 10. Finally, Grossman teaches selecting from the calculated border texture coordinates, masked texture coordinate coordinates and the input texture coordinates which one to be provided as an output texture coordinate based on the texture mapping mode, the signs of the masked texture coordinates, the signs of the border texture coordinates and the sign of the input texture coordinate; column 9-10.

It is noted that the masked texture coordinates refer to the input texture coordinates with masked off bits of the outside map factor field 307. Therefore, the masked texture coordinates are in the same format as the input texture coordinate as shown in Figure 3a having the sign bits as well as the outside map factor field 307.

It is also noted that the texel is the same as the texture coordinate and the color value is just an example of the texel value or the texture coordinate value. Texel value is the value corresponding to a texture coordinate. Applicant's claim invention set forth some formula for mapping the texture coordinates. The different texture mapping coordinates selected for different mapping modes are resulted from Routine Experimentation since Grossman discloses mapping to the texture coordinates selected for different mapping modes. Applicant merely modifies the Grossman's mapping texture coordinates to come up with the claimed invention. See *In re Aller*, 105 USPQ 233, 235; 220 F2d 454 (CCPA 1955) (Note: the Examiner mistype the court case in earlier Office Action).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jin-Cheng Wang whose telephone number is (571) 272-7665. The examiner can normally be reached on 8:00 - 6:30 (Mon-Thu).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mike Razavi can be reached on (571) 272-7664. The fax phone number for the organization where this application or proceeding is assigned is ~~703-872-9306~~. 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jcw

ALMIS R. JANKUS
PRIMARY EXAMINER